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**UNITED STATES PATENT APPLICATION**

of

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for

**APPARATUS AND METHOD FOR AIRBAG CURTAIN  
MODULE WITH SECONDARY ATTACHMENT DEVICE**

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1           **APPARATUS AND METHOD FOR AIRBAG CURTAIN**  
2           **MODULE WITH SECONDARY ATTACHMENT DEVICE**

3                   **BACKGROUND OF THE INVENTION**

4           **1. Field of the Invention**

5           The present invention relates to an airbag curtain module with a secondary  
6 attachment device. More specifically, the present invention relates to a novel apparatus  
7 and method for securing two separate longitudinal portions of a folded airbag curtain to  
8 the interior of a vehicle.

10          **2. Description of Related Art**

11          Inflatable safety restraint devices, or airbags, are mandatory on most new  
12 vehicles. Airbags are typically installed as part of a system with an airbag module in the  
13 steering wheel on the driver's side of car and in the dashboard on the passenger side of a  
14 car. In the event of an accident, a sensor within the vehicle measures abnormal  
15 deceleration and triggers the ignition of an explosive charge contained within an inflator.  
16 Expanding gases from the charge travel through conduits and fill the airbags, which  
17 immediately inflate in front of the driver and passenger to protect them from harmful  
18 impact with the interior of the car. Airbag systems have also been developed in response  
19 to the need for similar protection from lateral impacts between a passenger and the side of  
20 a vehicle's interior. This might occur when another vehicle collides with the side of the  
21 car, or in a rollover situation where the side of car is repeatedly impacting the ground.

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1 Another problem with known airbag modules stems from the fact that most roof  
2 rails to which the folded side impact airbag module is to be attached are not completely  
3 vertical. They are long angled pieces and even after a primary attachment area of the  
4 folded curtain is secured to the vehicle interior, the wrapped or covered curtain dangles  
5 down and away from the roof rail to which it is to be attached. The dangling airbag  
6 curtain module interferes with the assembly of the final interior trim. Additionally, side  
7 airbag curtain modules have less space in which to be installed, and it is preferable that  
8 they are installed in their most compact form. Dangling airbag curtain modules are not  
9 compact.

10 Thus, it would be an advantage to provide an airbag curtain module which  
11 allowed the installer to secure the primary attachment source to the interior of a vehicle  
12 without the need for extra tools, equipment, or human resources. It would also be an  
13 advantage to provide such an airbag curtain module that would allow the folded airbag to  
14 be pivoted out of the way and attached to the frame of a vehicle such that packaging and  
15 assembly of the final interior trim of the vehicle could be easily accomplished without  
16 interference from the folded inflatable curtain. It would also be an advancement to  
17 provide such an airbag curtain that was less expensive and easier to install.

18 Such an airbag curtain module and method of folding are disclosed and claimed  
19 herein.

20



At least one, and preferably multiple second attachment members are secured to an out-board side of the covering. When the covering is positioned about the folded airbag curtain, at least one of the second attachment members is positioned between at least one of the first attachment members and a bottom portion of the covering or module in locations anywhere along the longitudinal direction. Thus, the second attachment member may secure a second portion of the module between the first portion and a bottom portion of the module, when the first portion of the module is secured to the interior of the vehicle. This allows the module to be installed in closer conformity to the vehicle interior for greater compactness.

In one embodiment, the second attachment member includes a substantially flat magnet sewn into a pocket or affixed by any other attachment means on the outboard side of the cover. A plurality of magnets may be spaced adjacent to, and beneath the first attachment members or anywhere along the outboard side of the curtain when the covering is positioned about the curtain.

Each magnet has a magnetic field strength which permits the module to be secured to a vehicle interior and which also permits the detachment of the magnet from a vehicle interior with minimal force applied by a user. Thus, the user may opt to generally position the module against the vehicle roof-rail and temporarily secure the module with the magnets while securing the first attachment members in place. The magnets also allow the module to be removed without leaving residue or holes along the vehicle interior.

These and other objects, features, and advantages of the present invention will become more fully apparent from the following description and appended claims, or may be learned by the practice of the invention as set forth hereinafter.



present invention, as represented in Figures 1 through 4, is not intended to limit the scope of the invention, as claimed, but is merely representative of presently preferred embodiments of the invention.

With particular reference to Figure 1, an airbag module utilizing the present invention is generally designated at 10. The airbag module 10, includes an inflatable curtain 12 having a first edge 14 and a second edge 16. The curtain 12 is typically configured of 2 pieces of semi-permeable material attached to each other by means known in the art. The pieces may be attached to each other at seams 18 to form distinct chambers 20, each of which will retain inflation fluid such as gas produced by an inflator (not shown).

The airbag module 10 also includes a covering 22. The covering 22 is preferably configured to at least partially enclose the inflatable curtain 12 in a folded state. The covering 22 may be substantially as long as the curtain 12. In the preferred embodiment of the curtain 12 illustrated in Figure 1, the covering 22 is attached to the curtain 12 along a stitch line 24. The covering 22 may be configured to permit a first edge 26 of the covering 22 to be attached along a second edge 28 of the covering 22 about the curtain 12 when the curtain 12 is in a folded state.

The curtain 12 includes a plurality of first attachment members 30 spaced along the first edge 14 of the curtain, the first attachment members 30 allow a first portion 32 of the module 10 to be secured to the interior of a vehicle. The first attachment members 30 may be configured with an opening 31 to receive a connector such as a screw, bolt, rivet, pin and the like, for attaching the module 10 to a roof rail of the vehicle interior. In an alternative embodiment, the first attachment members 30 may be attached to the vehicle interior by adhesive, bonding, welding, and the like. In the embodiment illustrated in Figure 1, the attachment members are tabs 30. The tabs 30 extend from the first edge 14 of the curtain airbag 12 such that after the curtain 12 is in a fully folded state, the curtain



1 12 can be attached to the roof rail or other interior component of the vehicle (see Figure  
2 3).

3 The covering 22 includes at least one and preferably a same number of slots 34  
4 as the number of tabs 30. The slots 34 are positioned and configured to receive the  
5 attachment tabs 30. It will be appreciated that in this configuration, the curtain 12 may be  
6 folded and enclosed by the covering 22, and still leave the attachment tabs 30 accessible  
7 for attachment of the curtain 12 to the interior of the vehicle. The attachment tabs 30 also  
8 allow the curtain 12 to be inflated without interference from whatever means may be used  
9 to attach the curtain 12 to the vehicle. In another embodiment, the first attachment  
10 members 30 may be connected to or secured to part of the covering 22 itself. In this  
11 configuration, there would be no need for the slots 34.

12 At least one second attachment member 36 is positioned near the first attachment  
13 members 30. A plurality of second attachment members 36 may be positioned  
14 substantially parallel to the first attachment members 30. In the embodiment, illustrated  
15 in Figure 1, the second attachment members 36 are secured to the covering 22 such that  
16 when the covering 22 is secured about the folded curtain 12, and the module 10 is secured  
17 to the interior of a vehicle, the second attachment members 36 are below or adjacent to  
18 the first attachment member 30.

19 Referring now to Figures 2 and 3, the module 10 is illustrated in a folded  
20 configuration with the covering 22 secured about the folded airbag curtain 12. The  
21 plurality of second attachment members 36 are spaced along an out-board side 38 of the  
22 covering 22. The first attachment members 30, which in one embodiment extend from  
23 the first edge 14 of the curtain 12, extend through slots 34 in the covering 22. In the  
24 illustrated embodiment, the second attachment members 36 are aligned with the first  
25 attachment members 30. When the airbag module 10 is secured to the interior 40 (Figure

1 3) of a vehicle the second attachment members 36 are secured to the covering 22 are  
2 positioned below the first attachment members.

3 The second attachment member 36 is configured to secure a second portion 52 of  
4 the module 10 to the interior 40 of the vehicle when the curtain 12 is secured within the  
5 covering 22. The second portion 52 is between the first portion 32 and a bottom portion  
6 54 of the module 10 when the module 10 is secured to the interior 40 of the vehicle.  
7 Because the module 10, with the curtain 12 retained in a folded state, is long and narrow,  
8 the first portion 31 is a longitudinal portion adjacent the first attachment members 30 and  
9 the second portion 52 is also a longitudinal portion adjacent the second attachment  
10 members 36. Accordingly, once the first portion 31 of the module 10 is secured to the  
11 vehicle interior, the module 10 may be pivoted out of the way and attached at the second  
12 portion to the interior 40 by the second attachment members 36 (see Figure 4). The dual  
13 attachment configuration allows the module 10 to be compactly and efficiently secured  
14 within the vehicle.

15 The second attachment member 36 comprises a magnet 44 positioned within a  
16 pocket 46. The magnet 44 is substantially flat and thin for compactness. A plurality of  
17 magnets 46 are spaced near the first edge 14 of the inflatable curtain 12. Each magnet 44  
18 may be positioned opposite to, and adjacent to, one of the plurality of first attachment  
19 members 30. In a preferred embodiment, the pockets are configured along an outboard  
20 side 38 of the covering 22. The magnet 44 has a magnetic field strength which permits  
21 the detachment of the magnet 44 from a vehicle interior 40 with minimal force applied by  
22 a user. It will be appreciated by those of skill in the art that this allows the module 10 to  
23 be detached from the vehicle interior 40 in certain applications without leaving a  
24 noticeable hole, mark, or residue at the vehicle interior 40 adjacent the second portion 52  
25 of the module 10.

1 Each pocket 46 may be positioned along an exterior surface 48 of the outboard  
2 side 38 of the covering 22 or along an interior surface 50 of the outboard side of the  
3 covering 22. The pockets 46 may be sewn to the covering 22 using nylon thread. In the  
4 illustrated invention, number 46 nylon thread is used at six to eight stitches per inch. It  
5 will be appreciated by those of skill in the art that the covering 22 may be attached to the  
6 curtain 12 in a variety of ways, including but not limited to, adhesive bonding, chemical  
7 bonding, heat welding, RF welding, and swaging. The curtain 12, covering 22, and  
8 pocket 46 may be constructed of suitable materials including, but not limited to woven  
9 polymeric yarn fibers, such as nylon or polyester. Nylon 6 and nylon 6\_6 are examples of  
10 preferred yarn materials. Other conventional yarns can be used in the fabric layer,  
11 typically having a denier ranging from about 210 to 630. The weave density will vary  
12 depending upon the desired fabric permeability and the yarn denier. For a typical 420-  
13 denier yarn, the weave density will range from 46x46 yarns per inch to 53x53 yarns per  
14 inch. Other suitable materials may include non woven nylon, including Cerex PBN II at 3  
15 ounces per square yard. The curtain 12, covering 22 and pocket fabric may be coated  
16 with an impermeable coating on the interior surface (not shown) of the fabric. Currently  
17 preferred coating materials include, but are not limited to, urethanes and  
18 silicone/urethanes. Other known and novel fabric coating materials can be used. Once  
19 the magnets 44 are positioned within the pockets 46, a stitch may be placed at a pocket  
20 opening 47 to secure each magnet 44 within a respective pocket 46.

21 In an alternative embodiment, the second attachment member 36 includes an  
22 adhesive attached to the covering 22 sufficient to adhere the covering 22 to the vehicle  
23 interior 40. The second attachment member 36 may also include a clip attached to the  
24 covering 22 configured for attachment of the covering 22 to the vehicle interior 40. The  
25 second attachment member 46 may be secured relative to the first attachment member 30  
26 in a number of ways and still allow the module 10 to be pivoted into a more compact



1    only as illustrative, and not restrictive. The scope of the invention is, therefore, indicated  
2    by the appended claims, rather than by the foregoing description. All changes that come  
3    within the meaning and range of equivalency of the claims are to be embraced within  
4    their scope.

5            What is claimed and desired to be secured by United States Letters Patent is:

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